

State of Wisconsin/Department of Transportation
RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: December 31, 2007

Program: SPR-0010(36) FFY99		Part: II Research and Development	
Project Title: Effective Depth of Soil Compaction in Relation to Applied Compactive Energy		Project ID: 0092-08-11	
Administrative Contact: Nikki Hatch		Sponsor:	WHRP
WisDOT Technical Contact: Bob Arndorfer		Approved Starting Date:	10/7/07
Approved by COR/Steering Committee: \$54,914		Original End Date:	4/7/07
Project Investigator (agency & contact): Dante Fratta and Haifang Wen – University of Wisconsin-Madison		Current End Date:	4/7/09
		Number of Extensions:	0

Percent Complete: 10%

Request a No Cost Time Extension (Please Select One): ☐ YES ☒ NO

Reason for No Cost Time Extension: None

Project Description:

The determination of the appropriate lift thicknesses used in embankment construction operations has important economic and engineering implications in the design and construction of roads, levees and dams. For example, small lift thicknesses may cause excessive construction costs while large lift thicknesses may reduce the compaction effectiveness and may compromise the integrity of the embankment. This research proposal will use experimental results and numerical analyses to evaluate the effective depth of compaction. These results and analyses will provide the engineering understanding of the problem and justify recommendations about maximum lift thickness to be used in WisDOT embankment construction projects.

This proposed research program will collect data and develop analyses needed to determine optimum lift thickness for WisDOT embankment construction projects. The results will establish a relationship between the applied compaction energy and the level of compaction achieved at increasing depths for a number of different soils and moisture contents. The data, analyses, and correlations will help WisDOT officials in proposing possible revisions to current constructions specifications including the need to change the established 8-in lift thickness in the construction of compacted embankments. The successful completion of this research will also help WisDOT officials in improving construction operations by creating more stable and economical subgrade structures.

Progress This Quarter:

During the first quarter, the research team hired a graduate student to work on the project and focused its attention to Phase I of the proposal. Phase I included a review of the state of the art compaction research, leading DOT's practices and policies, and the evaluation of modern compaction equipment specifications. The research team also started with the evaluation of

theoretical/numerical and experimental methodologies for the evaluation of compaction efforts (Phase II). This information will be used to perform theoretical/numerical studies to evaluate the response of different soils to compactive efforts.

Work Next Quarter:

During the second quarter the research team will complete phase II (using data/experience obtained during phase II). The collected information, data and analyses performed during the development of Phases I and II will be summarized in an interim report to be submitted and presented to WisDOT officials for review and comments. This interim report, along with comments from the DOT will help in developing the research activities for Phases III through V (Phase III will start next quarter). The research team will also schedule a meeting with member of the Geotechnics TOC. The research team will request that the meeting be held during the month of February to discuss Phase III to V activities.

Circumstances Affecting Progress/Budget:

None.

See attached modified budget distribution. This new budget reflects the changes made necessary after Prof. Peter J. Bosscher's passing. The funding allocated for Prof. Bosscher's salary will be used to further support the research assistant working in this project.

Gantt Chart:

Phase Number	1.5 Years (18 months)					
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6
Phase I						
Phase II						
Phase III						
Phase IV						
Phase V						

REVISED BUDGET

Table: Justification of Proposed Budget

BUDGET WORKSHEET

WHRP Project: Effective Depth of Soil Compaction in Relation to Applied Compactive Energy

Table 1 Work Effort by Task

INDIVIDUALS	TASKS					TOTAL	Fringes	Total Direct
	1	2	3	4	5			
Principal Investigator - Dante Fratta	\$338	\$675	\$675	\$675	\$338	\$2,700	\$1,013	\$3,713
Principal Investigator - Peter Bosscher (Deceased)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Principal Investigator - Haifang Wen	\$450	\$600	\$600	\$600	\$450	\$2,700	\$1,013	\$3,713
Graduate Students (40% - 13.4 months)	\$2,115	\$3,172	\$5,816	\$5,816	\$2,643	\$19,561	\$5,379	\$24,941
Hourly Students						\$0	\$0	\$0
Office Staff						\$0	\$0	\$0
TOTALS	\$2,902	\$4,447	\$7,091	\$7,091	\$3,431	\$24,961	\$7,404	\$32,366

Table 2 Total Contract Summary by Federal Fiscal Year

								TOTALS
Total Salaries and Wages (From Table 1)	\$3,779	\$5,798	\$9,168	\$9,168	\$4,453			\$32,366
Tuition remission (\$8000/year + 3.4 semester month)	\$0	\$2,000	\$4,000	\$2,000	\$3,037			\$11,037
Materials & Supplies	\$0	\$1,000	\$500	\$500	\$0			\$2,000
Printing	\$0	\$0	\$0	\$0	\$1,000			\$998
Communications (CDs, Reports, Website)	\$0	\$0	\$0	\$0	\$0			\$0
Travel	\$0	\$700	\$650	\$0	\$0			\$1,350
Sub-Contracting (Database & communication develop	\$0	\$0	\$0	\$0	\$0			\$0
TOTAL DIRECT COSTS	\$3,779	\$9,498	\$14,318	\$11,668	\$8,491			\$47,751
Indirect Costs	\$567	\$1,425	\$2,148	\$1,750	\$1,274			\$7,163
Overhead								
TOTAL INDIRECT COSTS	\$567	\$1,425	\$2,148	\$1,750	\$1,274			\$7,163
TOTAL CONTRACT COST	\$4,346	\$10,922	\$16,466	\$13,418	\$9,764			\$54,914

Prof. Tuncer B. Edil (UW-Madison) and Mr. Brian S. Aebly, P.E. (Hoffman Construction Company) will be advisors to the research program and their time will be provided as in-kind contribution to the project.

Table 3: Budget Breakdown by Task (approx. hours for each member of the research team)

Budget Item	Number of Hours					
	Phase I	Phase II	Phase III	Phase IV	Phase V	Total
Dr. Dante Fratta	10	20	20	20	10	80
Dr. Haifang Wen	15	20	20	20	15	90
Graduate Student	200	300	550	550	250	1850

Prof. Fratta will be in charge of the design of field instrumentation for the evaluation of energy distribution under compaction systems. He will lead the evaluation of correlations between experimental data and predictive models and will draft recommendations for optimum lift thickness based on modeling, experimental and field data.

Prof. Fratta and Dr. Wen will lead the collection of published data and construction policies. They will also develop the theoretical/numerical and laboratory models for evaluation of compaction efforts. In the field, they will deploy instrumentation and collect data. In particular, Dr. Wen will be in charge of field testing. Finally, they will help in developing engineering correlation for compaction efforts and will draft optimum lift thickness recommendation based on research results.